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OIL AND GAS IN SOUTHEAST PENNSYLVANIA

By

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In a certain county in southeast Pennsylvania recently a group of men interested in drilling for oil formed a pool of several thousand dollars and put it in a hole in the ground. Captain Kidd some years ago is reported to have done likewise. Captain Kidd, however, intended to go back and get his wealth. These men on the contrary, after stuffing the hole full of good bank notes, and pounding them to powder, hadn't a chance of recovering their treasure.

"Hope springs eternal in the human breast" whether in the boy on the river bank watching his cork or in the Wall Street plunger, whose star of fortune is always just around the corner. Hope is the main spring to human progress and the lure that makes men gamble. Nowhere is hope more eternal than in the man who seeks riches from the depths of the earth. Whether it be gold or oil that he is after, he knows that out of the earth have come the wealth of Croesus and the power of England. He has looked in the faces of men who have become rich over night through a lucky strike. He knows that Fortune has been kind and may be again, so hope lures him on. He is willing to gamble on an oil well or a hole in the ground with a windlass at the top. One mark of the true gambler is that he is willing to take chances when he knows that they are against him. But he who takes a chance where the chances are 100 to 0 against him is not a gambler.

Pennsylvania has been a great oil state and out of its depths has come many a fortune. It still is a great oil state, though for twenty-five years its production of oil has steadily declined. Undoubtedly there are in Pennsylvania many pools of oil yet undiscovered, but they are all in a limited portion of the State. It is possible to draw a northeast-southwest line from Potter County through

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Cameron, Elk, Jefferson, Indiana, Westmoreland and Fayette counties and say that every tank car of oil produced in Pennsylvania to date has come from west of this line, and that probably all of the commercial oil gotten from the ground in the future will come from west of that line. Yet hardly a week passes but someone expresses his belief that oil exists east of this line. So wide-spread is the belief in many quarters that oil will some day be found in the State east of that line, that occasionally some company starts drilling for oil.

When stock is offered for sale by a company proposing to drill for oil in southeast Pennsylvania some people accept the statements of the vendors without question. Others ask the State Geological Survey what chance there is of getting oil in paying quantity by drilling in that part of the State. There are two ways of determining the answer to such a question. One is theory, the other is practice. Some prefer one and some the other. Sometimes the two work together and sometimes they do not. When they do not, theory has to back track and change its face, but in this case theory and practice hold together. Theory says "Nothing doing!" and Practice says "Amen."

It is not true that the eastern section of the State has been drilled full of holes and thoroughly tested, but it is true, so far as the facts have ever leaked out, that of the hundreds of holes drilled for oil east of the Allegheny Mountains, not one has found enough oil to pay the board bill of the driller. If it has, the secret has been kept wonderfully well. Therefore, according to Practice, the chances of the driller appear to be 100 to 0 against success.

Why isn't oil found east of the Allegheny Front? How does theory explain it? First, remember that practically all geologists are agreed that oil was derived from the remains of plants and animals buried in the rocks, when those rocks were being deposited as sands or muds or limey sediments on the bottom of the sea, or in lakes and lagoons. So called "oil shales" when examined under the microscope commonly show large quantities of plant or animal remains. If such a rock is heated at a relatively low temperature the remains of this old, living matter are broken up into oil and gas. If the temperature be high enough, the product will distill off as gas only, just as coal heated in a gas retort produces artificial gas for lighting and heating. If the heating be at a lower temperature, oil will be given off just as coal heated at a lower temperature will yield oil instead of gas. If such a shale has been distilled for oil or gas, it of course contains no more of these substances.

One who travels across Pennsylvania may notice that the rocks in the eastern part of the State do not lie flat, but are turned up edgewise and folded or squeezed. In the southeastern part of the State the rocks are just a folded, broken, jumbled complex not unlike an ice jam. West or northwest of the Cumberland-Lebanon Valley, the rocks as seen from the train are highly folded and occasionally a break may be seen; but as compared with the rocks in the southeast corner of the State, they have been treated much less roughly. In the bituminous coal fields, the rocks are not so well exposed, but they

can be seen in railroad cuts, with the bedding planes nearly horizontal, especially toward the western boundary of the State.

If rocks of the southeastern section of the State be examined carefully, something else may be seen. They are nearly all what are called igneous rocks or metamorphic rocks. Igneous rocks are those that have been in a molten condition deep in the earth and have cooled and solidified. Metamorphic rocks are those that while not melted, have been heated to such an extent that the character of the materials composing them has been changed. Rocks laid down as mud or clay have been changed into hard mud rocks or slates. Sand deposits, instead of simply being cemented and consolidated into sandstone, have been changed into hard quartzites, due to the solution of some of the sand by hot water and its redeposition. Obviously, such rocks can contain no oil today, because any oil that they ever may have contained has been distilled off.

Crossing the state from the southeast corner toward the west or northwest, after leaving the metamorphic rocks, we see first, the highly folded rocks, as going westward from Harrisburg toward Tyrone or northward toward Williamsport. The anthracite coal beds are infolded with the rocks of this much-disturbed area. West of Tyrone and north of Williamsport we cross the less strongly folded rocks of the eastern part of the bituminous coal field, and finally come to the nearly flat-lying rocks of the northeastern part of the State. Now if the coals in the various parts of the field be analyzed an interesting thing is found. The coals from the northwestern part of the State when heated, give off nearly one-half of their weight as gas. Farther east, where the rocks are slightly more folded, the amount of gas driven off when the coal is heated runs down to about one-third of the original weight of the coal. Along the eastern edge of the bituminous field, in Somerset, Cambria, and Clearfield counties, where the rocks are still more strongly folded, and have been under greater pressure, the coal when heated will yield only one-fourth to one-fifth of its weight in gas.

Still farther east the coals in the anthracite region yield less and less gas, until in the hardest anthracite, the gas is commonly less than one-twentieth of the weight of the coal. Everybody today believes that this change in the quantity of gas yielded is due to the action of the same forces that folded the rocks. In other words, the coals at the east which were originally no different from the coals at the west, have lost the gas they originally contained, much as though it had been distilled off in a gas house. If this be true of the coals, is it not bound to be true of the other rocks with which the coals are interbedded? As a matter of fact distillation tests on the coals and black shales of Pennsylvania have as yet failed to obtain oil from any coal or shale occurring east of the Allegheny Front.

Not many years ago, Mr. David White, of the U. S. Geological Survey, made an extensive study of the occurrence of oil in areas that contain coal beds also. He found that where the rocks had been subjected to such pressures or stresses that the percentage of gas in the coal had been reduced to a certain point, no oil was present.

The analyses of coals of Pennsylvania show that the percentage of gas in the coals has been reduced below that point east of Chestnut Ridge. As this theory is built on the actual findings of fact, not alone in this State, but over all the eastern United States where coal and oil are found in the same region, and as all of the experience to date has shown that the driller east of that line has the chances 100 to 0 against him, it looks as though the man who drills for oil in central or southeastern Pennsylvania is merely putting his own or other people's money into an undertaking predestined to failure.

